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SPECIAL TOOLS FOR CRITICAL CONNECTIONS TORQUE WRENCHES

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Abstract: We talk about the measurement of torque you're applying to a bolt while tightening it with a special tool, torque wrench. It's a basic connection tool, but is a very important one and most of us have not too much knowledge about this handy device. Every time, when you are working on equipment susceptible to damage because of too much bolt pressure or to vibration because of too little, you need to know how much torque you apply.

1. Torque wrenches-special tools for critical connections

Critical bolt connections require us to use a torque wrench and non-critical connections work better and longer when we use one. Selecting, using, storing and caring for torque wrenches properly can mean the difference between a safe installation and one that fails catastrophically.

Torque-sensing tools came in both powered and non-powered varieties. Powered tools normally operate on compressed air and generally are not suitable for field work. They also require significant maintenance and a higher degree of care than their non-powered counterparts.

Among the manual torque-sensing tools are special wrenches and screwdrivers. The wrenches came in beam, gage and breakaway configurations, while the screwdrivers come in gage and breakaway configurations. The same principles of selection and storage apply to all of them, and they are similar in their use.

The beam wrench is the simplest and least axpensive of torque wrenches. This type of wrench reads the actual torque, but has not provision to prevent you from exceeding the desired torque. Also, you must look directly at the scale and pointer to get an accurate reading. It has limited use in electrical work.

The analog "clock face" gage wrench is another type of "actual reading" wrench. Its big advantage is high resolution, but it requires looking at the gage and also has no provision against over-torquing.

The click or breakaway wrench is the third type of torque wrench. We use the term"breakaway" because at a predetermined torque value, the handle breaks away, as though suddenly becoming disjointed. You adjust a knob, dial, or cuff until the display reads the desired torque value (the preset one). This value tells you how much rotational force the wrench will support until it breaks away. For example, if you set the wrench for 60Nm, the handle will suddenly "fail" or "break away" when the wrench head sees 60Nm of force. The adjustment machanism compresses a calibrated spring, which allows the handle either to stay locked or "break" at the desired torque.

The breakaway torque wrench comes in two varieties. One has a digital preset. It's a digital brakaway torque wrench (digital wrench). The other one has an analog preset in the form of a vernier scale. The digital costs a little more care to prevent breakage. Both are appropriate for electrical work.

2. The selection of a torque wrench

To select a torque wrench, you have to know the torque requirement of the fastener, which is usually a bolt. The required torque is a function of the bolt's material and diameter.

Let's say, for example, you are tightening a bolt and you must apply 60Nm of torque. Suppose your torque wrench is a 10 –to- 60 Nm model (Table 1). The question is if you can tighten this bolt with confidence at the correct torque value, based on this tool's range.The answer is no. These devices depend on a calibrated spring, and thus they lose accuracy when you operate them below 20% or above 80% of their rated range. The correct torque wrench would read the required torque within 50% to 75% of its capacity (use a 20 –to- 120 Nm model).

Tabele 1

Meansurement Field Nm	Recomanded Meansurement Field. Nm	Maxim Torque Nm	The Division's Value Nm/div	The Square Part for Turning Round mm
1-10	3-7	10	0,25	A(B)6,3
2-20	8-14	20	0,5	A(B)10
10-60	25-45	60	2,0	A(B)12,5
20-120	50-90	120	2,5	A(B)20
50-250	120-180	250	5,0	B25

The range of the scale is the top of the scale and the bottom of the scale. For example, a 20 –to- 120 Nm wrench has a range of 20 to 120 Nm. The span is the difference between the top and the bottom of the range. In our example, the wrench has a span of 100 Nm. Add 50% and 75% of 100 Nm to the bottom of the range, and you are looking at 70 –to- 175 Nm.

Let's talk now about the spring. It must rest in a fully relaxed position. In other words, did the last user set the wrench to zero before putting it away? Springs work off the "metal memory" principle. When manufacturer makes a spring, it "sets" the spring into a predetermined shape. When you compress a spring and then release it, it returns to its former shape. If you compress a spring too long, however, it experiences a "memory shift" and begins to take on the shape you have compressed it to. Eventually, springs lose their memory.

If your wrench stored with its spring compressed, you need to test it. The next step is to send thetorque wrench out for calibration.

3. Rules of thumb for breakaway torque wrenches

There is more to applying a torque wrench than many people think. There are some dynamics at work here, even though you don't see them. Here are some guidelines to follow:

- Select a wrench that reads the desired torque at 50% to 75% of the wrench's capacity;
- Ratchet extentions do not affect the torque reading, because they do not extend the lever arm. However, they do increase the tendency to "slant" the wrench from the right angle needed for an accurate measurement. Always ensure your torque wrench is parallel to the plane the fastener sits in.

- "Crow's feet" and other extensions added between the wrench head and fastener cause the wrench to understate torque, because they add leverage on the end where you are measuring torque.
- For safe use grasp it by the handle grip.
- Never use a torque wrench that's been stored with the spring set above 10% of capacity;
- Always "exercise" a torque wrench throught its full range of settings before using it;
- Always apply smooth, sleady pressure to a torque wrench, do not jerk it;
- When a torque wrench breaks away, stop turning with it. Continuing to turn can damage the wrench and cause personal injury;
- Do not use a torque wrench for more than an hour withaut setting it to zero;
- Always store a torque wrench with the spring set at zero;
- Use a torque wrench as sparingly as possible, that is, don't instead of a regular wrench when you don't need to check torque;
- Always follow the instructions that come with the torque wrench;
- Know the location of qualified service centre to calibrate and lubricate your wrench;
- Use the torque wrench on "the rotating part" whenever possible. Normally, this is the nut, not the bolt. However, when the nut is inaccessible or the bolt is entering a threaded passage instead of a nut, you can tighten the bolt. Also, locking devices work best when you insert them under "the rotating part" instead of the other end.
- Always torque fasteners in steps. Related fasteners (those holding the same parts together) interact with each other, and you will not get true torque readings if you tighten them one at a time. You must torque all of them at each tightening stage.
  The normal stages for the above guidelines are 50%, 75%, and !00%. Some applications require five stages instead of three. Regardless of the ttightening patterns, percentages, or sequences, the principle is the same: you don't slap a wrench on a fastener and take it from slack to full tightness in one step. For example,if you are tightening to 55Nm, you would tighten all related fasteners to 30Nm first. The torque value for this first step is not critical. Your "calibrated wrist" would recognize this as "snug". The next step would be to 45Nm, which makes the nut just a little hard to turn. The final step is 55Nm, beyond which you do not obtain useful additional tightening force.

  You have to use the right sized socket. If you're using a wrench, keep your handle perpendicular to the shaft of the fastener and if you 're usinga torque screwdriver, keep your handle parallel to the shaft of the fastener**.** So, you don't slip and hurt yourself and this caution also increases accuracy.

  The time to release the pressure on the spring is when you have made your last torque check. It's always good to "exercise" the torque wrench before putting it away. Move thw torque setting through its full range of motion, then set it back to zero. As with all metal tools, store the wrench in a dry place.

  Many wrenches have a small hole (with a rubber plug) for lubrication. Dirt can destroy the torque wrench, so keep this hole plugged through the life of the torque wrench. Be sure to inspect this plug when your torque wrench comes beck from calibration. Leaving it out is an easy mistake to make.

  Treating your torque wrenches like the precision tools they are, will help you do the kind of quality work from which good reputations spring.

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